

# **METHOD FOR THE PRODUCTION OF FIBER PULP**

## **Cross Reference to Related Applications**

This is a continuation of prior PCT application No. PCT/EP02/01611, entitled  
5 "METHOD FOR THE PRODUCTION OF WOODPULP", filed February 15, 2002.

## **BACKGROUND OF THE INVENTION**

### **1. Field of the invention.**

The present invention relates to a method for the production of fiber pulp for further utilization in the production of a fiber web, especially a paper or cardboard web.

### **10 2. Description of the related art.**

Fiber pulp is produced in pulp mills through various methods. The raw materials are natural raw materials, such as (predominantly) wood, straw, jute, etc. Wood for example is cooked in a cooking process and the pulp fibers are leached out and are subjected to quality improvement in further process steps (i.e. bleach, washing, etc.). At the end of the process the  
15 pulp is thickened, dried and transported to the paper mills, for example in the form of bales. There, the fiber pulps are again dissolved in pulpers and are prepared for the paper manufacturing process, for example refined and mixed with fillers. This can occur through direct addition of a filler, for example calcium carbonate ( $\text{CaCO}_3$ ), or through loading of the surfaces of the pulp fibers with a precipitated additive, for example, a filler such as calcium  
20 carbonate.

Loading with an additive, for example a filler, can occur through a chemical precipitation reaction, especially through a so-called "Fiber Loading<sup>TM</sup>" process, as described in addition to other publications, in U.S. Patent No. 5,223,090. In this type of "Fiber Loading<sup>TM</sup>" process at least one additive, especially a filler is deposited onto the moistened fiber surfaces of the fibrous  
25 material. The chemical precipitation reaction occurs preferably directly on the fiber surfaces.



consistencies, optical characteristics, the specific volume ( $\text{cm}^3/\text{g}$ ) and the porosity, as well as the formation of the produced paper can be increased or improved.

An additional advantage of the present invention is that the fibers can be loaded centrally, at the pulp mill. Therefore, only one single larger loading station for all the pulp mill customers  
5 combined is necessary. In contrast, if the loading process is decentralized, then an individual loading station is required for each customer. Overall, this loading process is less efficient due to cumulative longer downtimes and set-up times.

An additional advantage is found in that the pulp which is loaded with precipitated filler is easier to thicken and accordingly easier to dry. This results in pulp slabs that are produced in  
10 the pulp mill for shipment and that are generally several times thicker than paper ( $> 1000 \text{ g/m}^2$ ) can be dried economically to a much higher level of dry content than previously. Since correspondingly less water needs to be transported, shipping costs are reduced. At the same time considerable energy savings are possible when producing the same shipping dry content.

A further advantage is that due to the combination of the pulp production and the loading  
15 processes, the strength potential of the fibers, and accordingly, the strength of the paper that is subsequently produced in the paper mill, can be considerably increased or, that less fiber material is required for a given paper consistency. On the one hand this is attributed to the fact that through the combination of the loading process at the time of the pulp production, considerably more calcium carbonate reaches the inside of the fibers since the fiber walls are still soaked,  
20 thereby facilitating penetration of, for example, milk of lime. On the other hand it is also attributed to that, for a desired filler content in the paper, a portion of the filler is bonded inside the lumen of the fibers. Therefore the fiber bonding points on the outside surface of the fibers are not blocked.

In accordance with an advantageous practical arrangement of the present invention, the fiber pulp is subjected to bleaching, either after, or in combination with the fiber loading process. At least one bleaching agent such as peroxide, chlorine, oxygen, ozone and/or similar agents can be added to the fiber pulp. Bleaching may also occur in multiple stages with various bleaching agents. It is especially advantageous that the bleaching process can be combined after the “Fiber Loading™” process with the bleaching process that is generally conducted in the pulp mill. This reduces the expenditure for the chemical reagent preparation, as well as the expenditure for waste handling and reprocessing of the waste products accordingly.

According to an advantageous arrangement of the present invention the fiber pulp possesses a dry content after the drying process that is greater than 80%, especially greater than 85%, advantageously greater than 90% and preferably greater than 95%. If necessary, the pulp may be refined after the loading process, thereby still further increasing the level of freeness and strength potential. As already mentioned, the fiber pulp can be loaded, especially with precipitated calcium carbonate.

The pulp production process can for example include the cooking of natural fibers. Advantageously, the pulp is supplied in the form of bales, rolls or similar forms for further use or for shipment. The present invention is also applicable with semi-fiber pulp and mechanical pulps (stone ground wood, GMP, brown mechanical pulp, refiner mechanical pulp RMP, thermo-mechanical pulp TMP, CTMP).

The present invention can be utilized advantageously with fiber pulps that are produced according to the sulfate process and/or according to the sulfite process. In the sulfate pulping process calcium hydroxide is used for the chemical recovery. Here too, a clear synergetic effect is achieved by the present inventive combination of the relating process steps. In addition, it is advantageous when considering the economic supply of raw materials, a fiber pulp that was

produced according to the present inventive process is used in producing a fiber web, especially a paper or cardboard web.

When loading the fibers with, for example a filler, calcium carbonate ( $\text{CaCO}_3$ ) is deposited on the moistened fiber surfaces by adding calcium oxide ( $\text{CaO}$ ) and/or calcium hydroxide ( $\text{Ca}(\text{OH})_2$ ) to the moist fiber material, whereby at least a part of which can associate itself with the water of the fibrous stock volume. The thereby treated fiber material is then treated with carbon dioxide ( $\text{CO}_2$ ). The term “moistened fiber surfaces” can encompass all moistened surfaces of the individual fibers. This specifically also includes the scenario where the fibers are loaded with calcium carbonate or any other desired precipitant on their outside surfaces as well as on their inside (Lumen).

According to the present invention the fibers are loaded with the filler calcium carbonate, whereby the loading onto the moistened fiber surfaces occurs through a so-called “Fiber Loading<sup>TM</sup>” process, as described in U.S. Patent No. 5,223,090. In this “Fiber Loading<sup>TM</sup>” process the carbon dioxide with the calcium hydroxide reacts to water and calcium carbonate.

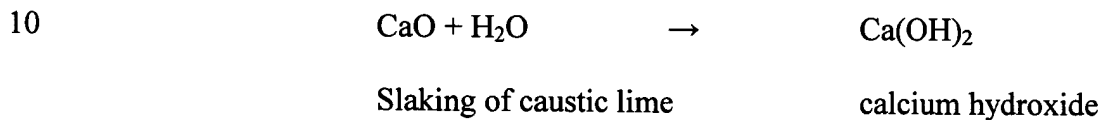
#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawing, which is a schematic view of an embodiment of the present invention. The exemplification set out herein illustrates one preferred embodiment of the invention, in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

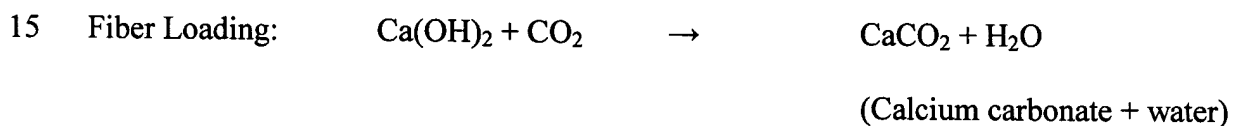
## DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawing, an initial process step 10 includes a fiber pulp preparation and production. The fiber pulp created through this production process is then loaded with an additive, for example a filler in a subsequent process step 12 by way of a chemical precipitation  
5 reaction.

Especially calcium oxide and/or calcium hydroxide (slaked lime) is added to the fiber material in such a way that at least a portion of this can associate itself with the water that is contained in the fiber material, i.e. between the fibers, in the hollow fibers and in their walls, thus creating the following chemical reaction:



The fiber material is then treated with carbon dioxide (CO<sub>2</sub>) in the relevant reactor, so that calcium carbonate (CaCO<sub>3</sub>) is extensively deposited on the moistened fiber surfaces. This results in the following chemical reaction:



Thickening and drying of the pulp (see process step 14) occurs following this fiber loading process. The loaded, thickened and dried pulp is then prepared for application or for shipment 16 (i.e. bales, roles, etc.).

20 While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present

disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

### **Component identification**

- 10 Fiber pulp production process
- 12 Fiber loading process
- 14 Thickening, Drying
- 16 Shipping

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